

This page Is Inserted by IFW Operations  
And is not part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of  
The original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

## **IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
Please do not report the images to the  
Image Problem Mailbox.**

What I claim is:

1. Apparatus for use in performing surgery for fusing vertebrae comprising a hollow tubular outer sleeve having a plurality of teeth or pins at one end for engaging two adjacent vertebrae, said teeth being substantially in line with the side surfaces of said outer sleeve, so that said teeth or pins not do substantially increase the diameter of said outer sleeve.
2. The apparatus of claim 1 including penetration preventing means for preventing penetration of said teeth.
3. The apparatus of claim 2 in which said penetration preventing means is lockably adjustable.
4. The apparatus of claim 2 in which said penetration preventing means comprises flat portions between at least some of said teeth.
5. The apparatus of claim 1 including a removable hollow inner tubular sleeve.
6. The apparatus of claim 5 in which said inner sleeve has a collar at one end larger than the inside diameter of said outer sleeve.
7. The apparatus of claim 1 in which said outer sleeve includes means for restricting its removal from the disc space after insertion.
8. The apparatus of claim 7 in which said means for restricting removal comprises ratchetings.
9. The apparatus of claim 1 in which said outer sleeve has an increased outer diameter portion at its upper end.
10. The apparatus of claim 9 including a cap, said cap having an opening in one end having an inside diameter larger than the outside diameter of said increased diameter portion of said outer sleeve.
11. A spinal distractor, said spinal distractor having a front portion the width of a disc space between adjacent vertebra, a barrel extending from said portion, said barrel having a first end and a second end and a diameter larger than the front portion, a shoulder at the juncture of the front portion and said increased diameter portion for preventing said barrel from entering the disc

00626636 072700

002220-9599950

space, said second end terminating in a head.

12. The spinal distractor of claim 11 in which said second end of said barrel has a reduced diameter portion.

13. The spinal distractor of claim 11 in which said barrel is removably attached to said front portion.

14. The spinal distractor of claim 13 in which said front portion includes a second threaded portion for engaging a corresponding threaded portion in the first end of said barrel.

15. The spinal distractor of claim 14 in which said front portion includes an engagement means for engaging a corresponding engaging means on the first end of said barrel.

16. The spinal distractor of claim 15 in which said barrel includes a central opening and a shaft having a first end and a second end having a third threaded portion for engaging the second threaded portion of said front portion.

17. The spinal distractor of claim 16 in which said second end of said shaft includes a head having a reduced diameter portion.

18. The spinal distractor of claim 12 including a removably attachable knob having means for releasably engaging said head.

19. The spinal distractor of claim 18 in which said knob engages the reduced diameter portion of said head.

20. Apparatus for use in performing surgery for fusing vertebrae comprising a pair of hollow tubes joined together along their longitudinal axis, and having engagement means at one end for engaging adjacent vertebrae.

21. The apparatus of claim 20 in which said hollow tubes are rigidly fixed by a footplate.

22. The apparatus of claim 21 in which said engagement means are positioned on said footplate.

23. The apparatus of claim 22 in which said engagement means comprises a plurality of prongs.

24. The apparatus of claim 20 in which said engagement means comprises projections.

25. A spinal distractor removing device for removing a distractor in a disc space, consisting of a shaft, a means for attaching to a

spinal distractor at one end and an increased diameter portion at the other end and a freely slidable mass affixed to the shaft between the two ends.

26. The device of claim 25 in which said engagement means comprises a slot for engaging a reduced diameter portion of the head of a spinal distractor.

27. A drilling member for use in a spinal surgical procedure comprising a drill bit, said drill bit having a lower portion, a narrowed diameter central portion, and an upper portion, said upper and lower portions being the same diameter.

28. The apparatus of claim 27 including a stop means said stop means comprising an increased diameter collar on the upper portion of said drill bit at a predetermined position for restricting penetration of said drill.

29. The apparatus of claim 28 in which said stop means is lockably adjustable.

30. Apparatus for use in performing spinal surgery comprising a hollow tubular member having drill teeth at one end and a cylindrical projection extending beyond said drill teeth.

31. The apparatus of claim 30 including a stopping means, said stopping means comprising a shoulder at the other end of said tubular member.

32. The apparatus of claim 31 in which said stopping means is lockably adjustable.

33. A combined distractor and drill for use in performing spinal surgery comprising a hollow drill bit having teeth and a nipple extending from one end, said nipple distally formed to be a spinal distractor.

34. Apparatus for use in spinal surgery comprising a handle, a shaft, said shaft connected to said handle at one end and having a cutting blade at an angle to said shaft said shaft connected off centered to the central axis of said handle.

35. An implant loading device for use in spinal surgery comprising a bone harvester having a first hollow tubular member having cutting teeth at one end and an adapter at its other end;

00626636.072700

a second hollow tubular member having engagement means at one end for engaging an implant holder and an adapter at its other end for receiving a bone harvester, said second hollow tubular member surrounding said first tubular member; and plunger means for fitting within and extending through said first hollow tubular member.

36. The apparatus of claim 35 in which said bone harvester is removably connectable to a drilling attachment for engagement with a drill.

37. The apparatus of claim 35 in which the inside diameter of said bone harvester is approximately the diameter of said implant.

38. An implant removal/insertion device for inserting or removing an implant in the body of a patient, said implant having a generally cylindrical configuration, a thread on its outside perimeter and a central threaded portion; said removal/insertion device comprising a first tubular member having an outside diameter and thread corresponding to the central threaded portion of said implant and an engaging means for engaging a portion of the implant, whereby, said engaging means is fixed to said implant; said engaging means being rotatable in relationship to said first tubular member.

39. The device of claim 38 further including a lockably adjustable stopping means.

40. The apparatus of claim 38 in which said implant has a shoulder and said engaging means comprises a corresponding member for fixing to said shoulder.

41. The apparatus of claim 38 in which said engaging means has handle means extending perpendicularly from said engaging means for rotating said engaging means.

42. A method for inserting a spinal implant between two adjacent vertebrae comprising inserting a hollow tubular member having engagement means for engaging two adjacent vertebrae into the vertebrae; passing a drill through said tubular member to drill a hole in the disc and a portion of the two adjacent vertebrae; removing the drill; inserting an implant in the vertebrae through

006026636 072700

said tubular member; and then removing said tubular member.

43. The method of claim 42 in which said implant is cylindrical.

44. The method of claim 42 in which said step for inserting an implant comprises inserting one or more partially cylindrical implants.

45. The method of claim 42 in which said implant has a diameter corresponding to the diameter of the opening formed by the drill.

46. The method of claim 42 in which said drill has means associated therewith for limiting the depth of the drilling.

47. The method of claim 42 in which said depth limiting means is lockably adjustable.

48. The method of claim 42 in which the tubular member has a removable hollow inner sleeve.

49. The method of claim 42 in which the hollow tubular member has means for limiting its penetration into the vertebrae.

50. The method of claim 49 in which said depth limiting means is lockably adjustable.

51. The method of claim 42 in which said implant is made of bone.

52. The method of claim 42 in which said implant is made of a material that promotes bone ingrowth.

53. The method of claim 42 in which said hole in the disc and a portion of the adjacent vertebrae is tapped with a thread.

54. The method of claim 42 in which the tubular member has a removable hollow inner sleeve.

55. The method of claim 54 in which said hole is drilled through the hollow inner sleeve and said hollow inner sleeve is removed prior to tapping said hole.

56. The method of claim 53 in which said tubular member has a removable inner sleeve.

57. The method of claim 56 in which said hole is drilled through the hollow inner sleeve and said hollow inner sleeve is removed prior to tapping said hole.

58. The method of claim 55 in which the inside diameter of the hollow inner sleeve is the same diameter as the root diameter of

the implant.

59. The method of claim 55 in which the inside diameter of the hollow inner sleeve is slightly greater than the root diameter of the implant.

60. A method for inserting a spinal implant between two adjacent vertebra comprising inserting a spinal distractor in the disc space on one or both sides of the spinal column to provide for proper spacing of the disc space between the vertebra, inserting over the spinal distractor a hollow tubular member having engagement means for engaging two adjacent vertebrae into the vertebrae; removing the spinal distractor from the hollow tubular member; passing a drill through the tubular member to drill a hole in the disc and a portion of the two adjacent vertebrae; removing the drill; inserting an implant in the vertebrae through the tubular member; and then removing said tubular member.

61. The method of claim 60 in which said implant is cylindrical.

62. The method of claim 60 in which said step of inserting an implant comprises inserting one or more partially cylindrical implants.

63. The method of claim 60 in which said implant has a diameter corresponding to the diameter of the opening formed by the drill.

64. The method of claim 60 in which said drill has means associated therewith for limiting the depth of the drilling.

65. The method of claim 64 in which said depth limiting means is lockably adjustable.

66. The method of claim 60 in which the tubular member has a removable hollow inner sleeve.

67. The method of claim 60 in which said hollow tubular member has means for limiting the penetration of the engagement means into the vertebrae.

68. The method of claim 67 in which said means for limiting penetration is lockably adjustable.

69. The method of claim 60 in which said implant is made of bone.

70. The method of claim 60 in which said implant is made of a

090220 072300

material that promotes bone ingrowth.

71. The method of claim 60 including tapping a thread into said hole in the disc.

72. The method of claim 60 in which the tubular member has a removable hollow inner sleeve.

73. The method of claim 72 in which said hole is drilled through the hollow inner sleeve and said hollow inner sleeve is removed prior to tapping said hole.

74. The method of claim 72 in which the inside diameter of the hollow inner sleeve is the same diameter as the root diameter of the implant.

75. The method of claim 72 in which the inside diameter of the hollow inner sleeve is slightly greater than the root diameter of the implant.

76. The method of claim 60 in which one spinal distractor remains in place in the disc while a first implant is being inserted.

77. The method of claim 76 in which said spinal distractor remaining in place includes a barrel portion that is separable from the front portion of the spinal implant in the disc space.

78. A method for inserting a spinal implant between two adjacent vertebra comprising inserting a spinal distractor in the disc on one side of the spinal column to provide for proper spacing of the disc space between the vertebra, inserting over the spinal distractor a hollow tubular member having engagement means for engaging two adjacent vertebrae into the vertebrae; passing a trephine through the tubular member and over the spinal distractor to drill a hole in the disc and a portion of the two adjacent vertebrae; removing the trephine; inserting an implant in the vertebrae through the tubular member; and removing said tubular member.

79. The method of claim 78 in which said implant is cylindrical.

80. The method of claim 78 in which said step of inserting an implant comprises inserting one or more partially cylindrical implants.

81. The method of claim 78 in which said implant has a



corresponding diameter to the diameter of the opening formed by the trephine.

82. The method of claim 78 in which said trephine has means associated therewith for limiting the depth of the drilling.

83. The method of claim 82 in which said depth limiting means is lockably adjustable.

84. The method of claim 78 in which said depth limiting means includes a shoulder within said trephine.

85. The method of claim 78 in which the tubular member has a removable hollow inner sleeve.

86. The method of claim 78 in which said hollow tubular member has means for limiting the penetration of the engagement means into the vertebrae.

87. The method of claim 86 in which said penetration limiting means is lockably adjustable.

88. The method of claim 78 in which said implant is made of bone.

89. The method of claim 78 in which said implant is made of a material that promotes bone ingrowth.

90. The method of claim 78 including tapping a thread into the hole and said cylindrical implant has a thread.

91. The method of claim 78 in which the one spinal distractor remains in place in the disc while the first implant is being inserted.

92. The method of claim 91 in which said spinal distractor remaining in place includes a barrel portion that is separable from the front portion of the spinal implant in the disc space.

93. The method of claim 78 further including the step of freeing and removing any remaining bone cut by the trephine from within the trephine.

94. The method of claim 93 in which the remaining cut bone is removed from the trephine by an apparatus comprising a handle, a shaft, said shaft connected to said handle at one end and having a cutting blade at an angle to said shaft, said shaft connected off centered to the central axis of said handle.

95. A corkscrew comprising a handle, a coil, said coil connected

to said handle at one end and having a cutting tip at an angle to said coil at the other end, said cutting tip extending substantially the diameter of said coil and off centered to the central axis of said coil whereby rotation of said corkscrew causes said cutting tip to radially cut a path substantially the diameter of said coil.

96. The corkscrew of claim 95 further comprising a hollow tubular member to partially cover said coil and contain a bone piece cut by said cutting tip.

97. The corkscrew of claim 96 wherein the cutting tip is self aligning.

98. An impaction device for use in spinal surgery comprising:

a spinal distractor inserted in the disc space between two vertebrae;

a hollow tubular outer sleeve having a toothed front end and a circumferentially enlarged tubular back end, said back end having a raised crown portion;

tubular back end of an outer sleeve, and a second smaller recess for engaging a crown.

103. A method for securing a hollow tubular sleeve to two adjacent vertebrae comprising:

inserting a spinal distractor in the disc space on one side of the vertebrae, said distractor having a flat shoulder portion abutting the vertebrae;

placing said hollow tubular sleeve having on one end engagement means for engaging two adjacent vertebrae and a circumferentially enlarged tubular back end, said back end having a raised crown portion, said sleeve being placed over said distractor, said distractor serving as a centering post and as an alignment rod for said outer sleeve;

engaging a driver cap to said tubular back end, said driver cap having a closed rear surface on one end and a circular front opening at the other end, said driver cap defining a first large recess within said circular opening for engaging the tubular back end of said outer sleeve, and a second smaller recess for engaging said crown portion forming an internal shoulder between said first and second recesses;

applying an impaction force with an impacting means to said driver cap whereby said force is transmitted via said internal shoulder to said outer sleeve until said crown is seated within said second recess;

removing said driver cap from said back end; and

removing said distractor with a distractor pulling means leaving said outer sleeve in place.

104. The method of claim 103 in which said outer sleeve includes penetration preventing means for preventing penetration of said teeth.

105. The method of claim 104 in which said penetration preventing means is lockably adjustable.

106. The method of claim 104 in which said penetration preventing means comprises flat portions between at least some of said teeth.

add B  
\\p21\spinal\sp5  
6/10/93 Thu 3:02pm